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Ancient Monuments Laboratory
Report 12/92

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Summary

Over 40 kg of slag and other technological samples were recovered from the excavations carried out in 1988/89 at Slough House Farm and around 0.4 kg from Chigborough Farm. Most of the evidence for the pre-Saxon period was limited to small-scale iron smithing, with the possible addition of some salt production evidence from Chigborough Farm. The finds from the Saxon period at Slough House Farm were mainly evidence for smelting of iron, possibly debris from a third site at Rook Hall.

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SUMMARY

Over 40 kg of slag and other technological samples were recovered from the excavations carried out in 1988/89 at Slough House Farm and around 0.4 kg from Chigborough Farm. Most of the evidence for the pre-Saxon period was limited to small-scale iron smithing, with the possible addition of some salt production evidence from Chigborough Farm. The finds from the Saxon period at Slough House Farm were mainly evidence for smelting of iron, possibly debris from a third site at Rook Hall.

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Slough House Farm - Introduction

The site at Slough House Farm is one of many sets of crop marks that appear on the north side of the Blackwater Estuary in Essex (See figure 1). The excavations revealed evidence of occupation from the Neolithic through to the medieval period. They produced evidence of ironworking, especially during the Saxon period, including some evidence of iron smelting. The technical terms used in this report are more fully explained in McDonnell (1983) and Bayley (1985).

The technological samples consisted of large amounts of both smelting and smithing slag along with a sizeable number of fragments of furnace/hearth lining and some iron 'objects'. The samples were all individually examined and weighed and a catalogue was produced (Table 2). The finds are not individually numbered but are catalogued by context. A map of the site with the contexts and main features marked will be found in Figure 2.

Fuel Ash Slag

A large amount (9 kg) of fuel ash slag was recovered from context 979, the middle fill of a Middle Iron Age gully. This type of slag is formed by ash and siliceous materials reacting together within the fire. Its production is not necessarily associated with ironworking and is merely indicative of fires at high temperatures. Some other small samples of fuel ash slag were also found, including two samples from the badly dated Main Habitation Area section, found in association with Roundhouse C.

Ironworking Slags

The vast majority of this material came from pit F195 with smaller amounts from F130 and F603. All these features were dated to the 6th or early 7th century and lay towards the east end of the site, close to the Rook Hall site which has produced considerable quantities of contemporary ironworking debris (Adkins 1989). The Slough House Farm slag was all found dumped in secondary contexts. The presence of more than the odd fragment of furnace/hearth lining suggests that the slag had not been transported far, so it is likely that it was produced on the Rook Hall site and can thus be taken as representative of that far larger collection of debris.

Evidence for smelting was found most notably in context 204, the middle fill of pit F195 (see Figures 2 and 3), which is dated by pottery to the 6th century AD. This fill was a charcoal rich sandy silt loam, which suggests that the pit was being used as a dump for ironworking waste. The finds included three furnace bottoms, the slag that collects in the base of a furnace, each weighing over 3 kg. The diameters of these were measured and found to be 175-195mm, 150-185mm and 190-240mm, and their maximum heights 95mm, 90mm and 10mm respectively. Also excavated were large pieces of dense slag which may also have been parts of other furnace bottoms.

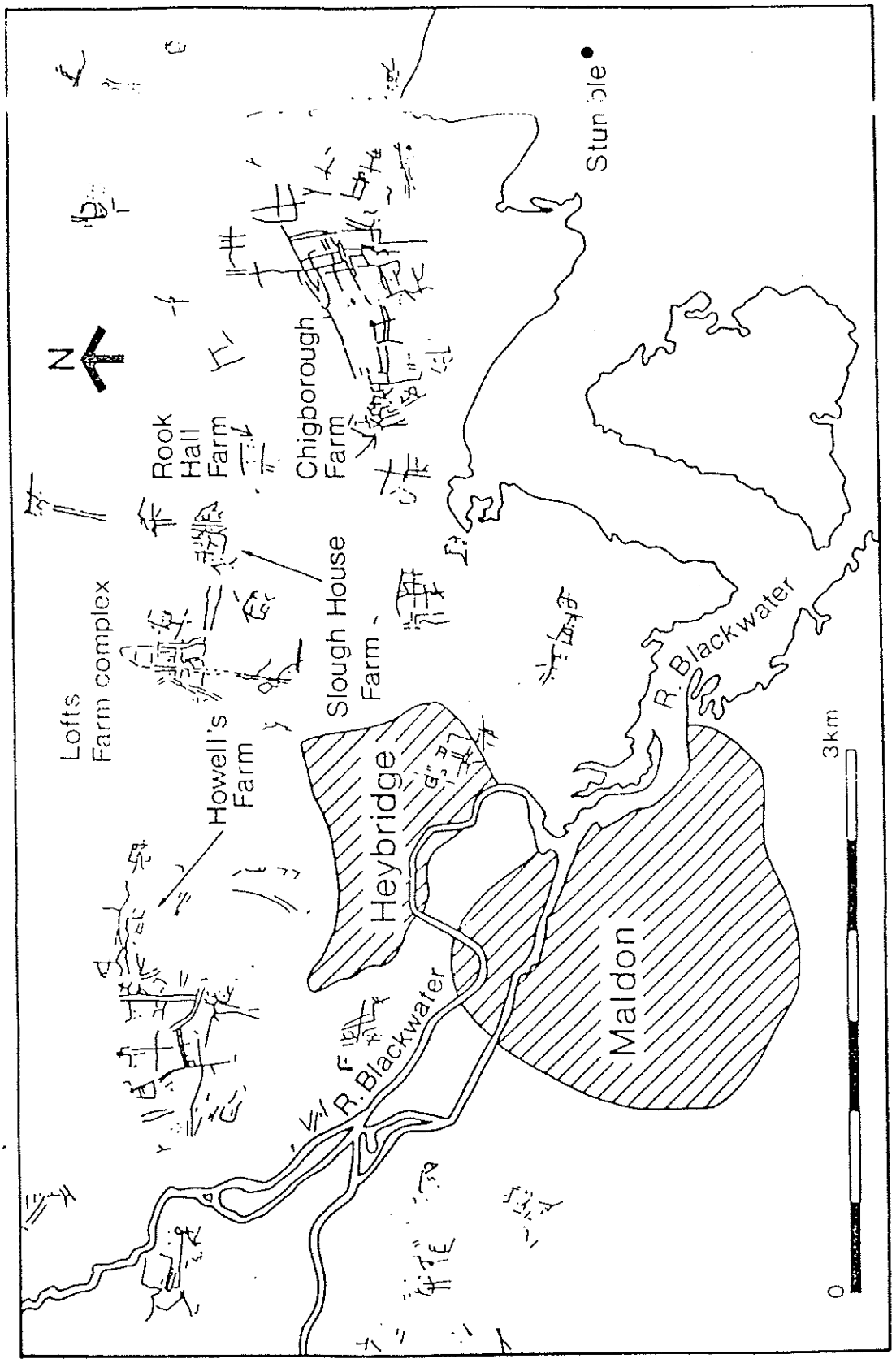

Figure 1. General Area and Location of Sites Referred to in the Text.

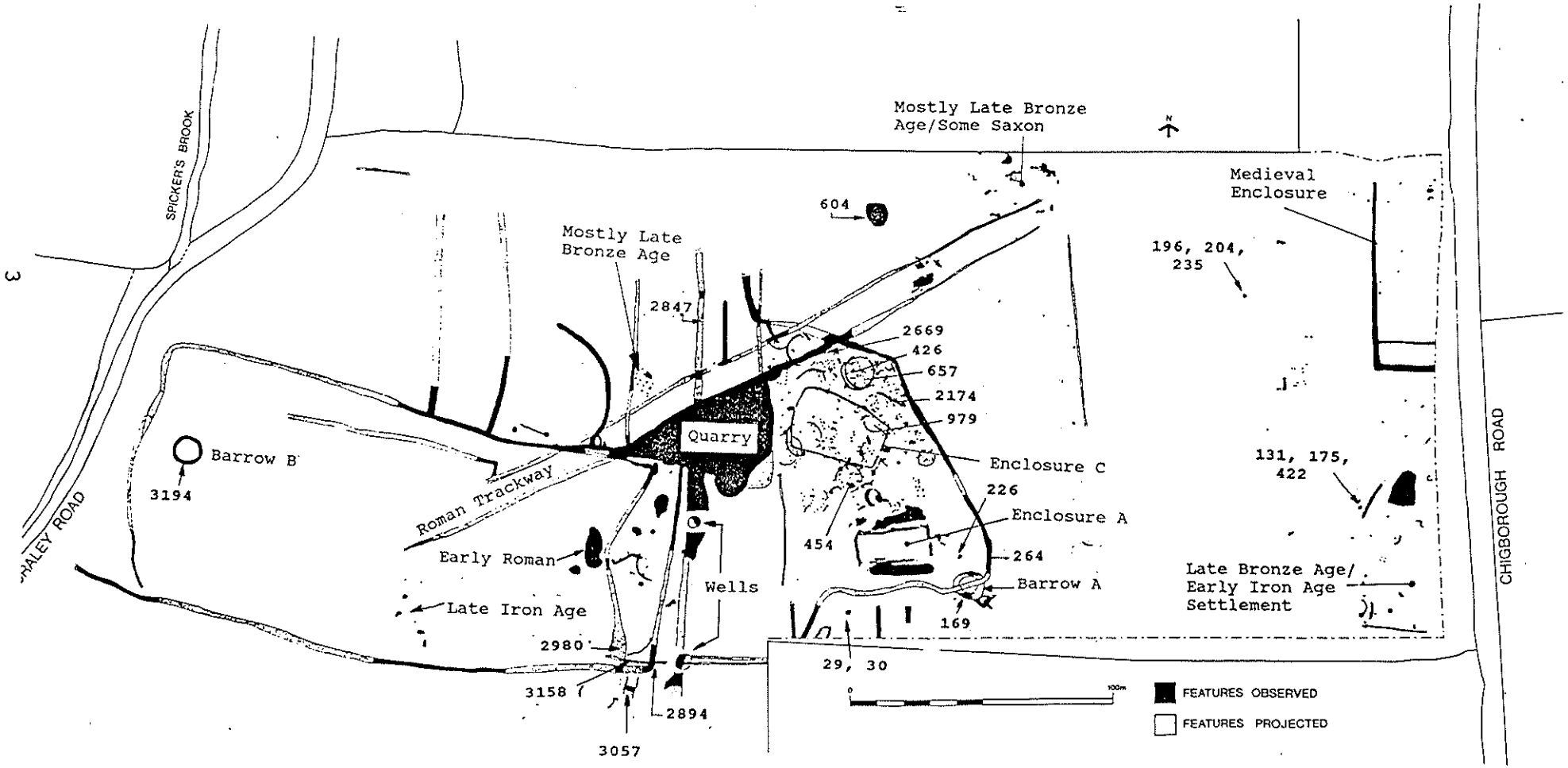

Figure 2. Plan of Slough House Farm Excavations Showing Contexts and Features Referred to in the Text.

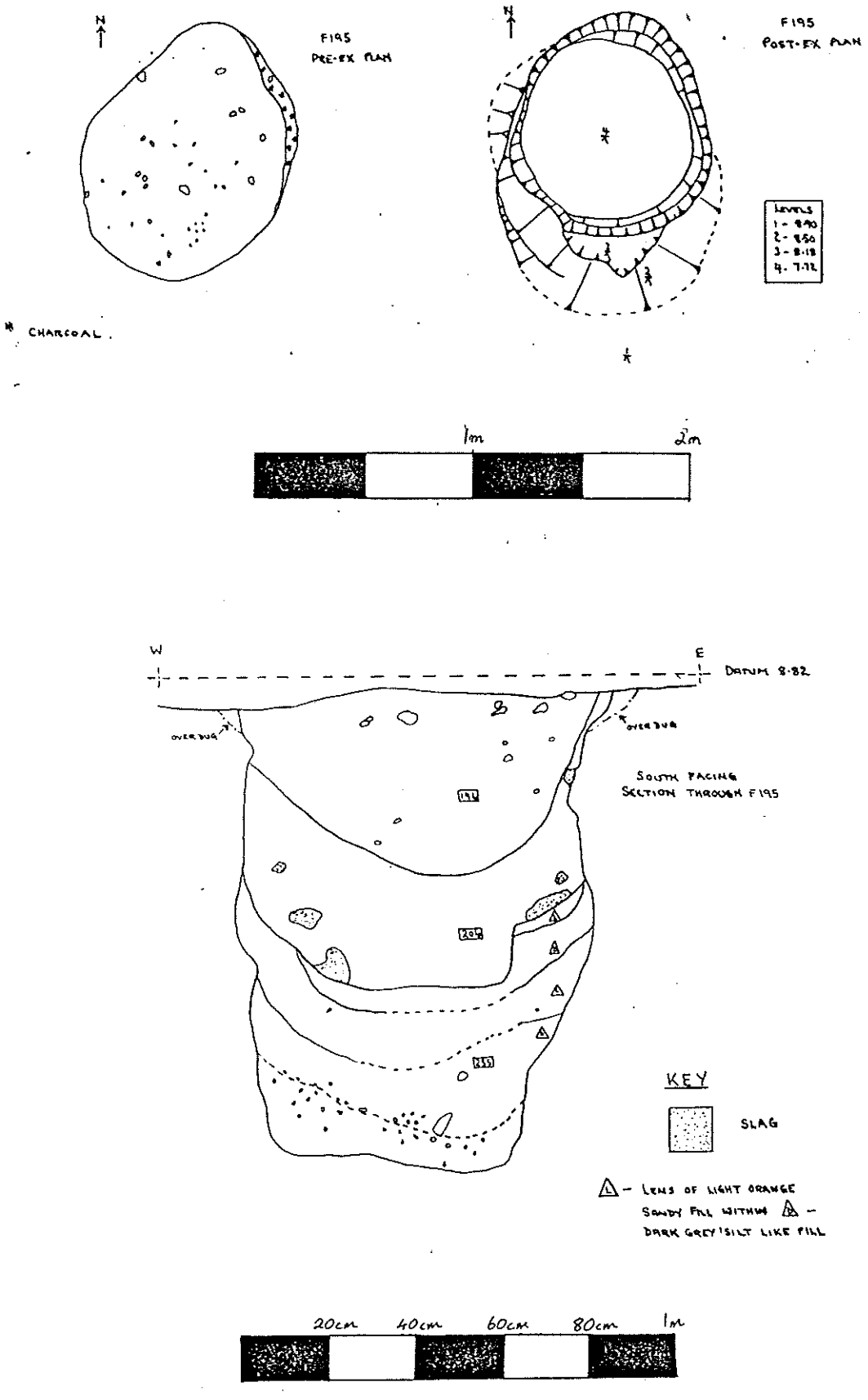

Figure 3. Plans and Section of Slough House Farm Feature F195, an Anglo-Saxon Pit of Probable 6th Century Date.

Other slag finds included some less dense small samples which have been labelled as probable smithing slag and some, usually very small, pieces which could not be identified exactly and have been recorded as ironworking slag. A miscellaneous collection of objects from this context included some geological material, including flint and a large piece of ironstone which had been subjected to high temperatures. The ironstone is not, however, likely to have been used as an ore.

Some fragments of ceramic were also present. These were oval-sectioned cylindrical shapes of coarse, bloated ceramic which were covered with a liverish purple/red vitrified layer. This colouration is common for iron rich vitrification. The origin of these objects is unclear, although they may be wasters (fired pottery ruined by a kiln that was too hot) which have been disposed of in the same pit as the ironworking waste. This context also produced a fairly large amount of hearth/furnace lining and also some small pieces of daub which may have been part of the furnace structure. Other ceramics recovered were of a similar fabric to that found attached to the hearth/furnace lining samples and so may also derive from ironworking structures.

The other contexts of pit F195 also produced ironworking evidence. The lower fill (context 235) produced ironworking slag while the upper fill (context 196) contained very similar material to 204, including slag, charcoal, hearth lining and ceramics.

The well consisting of contexts 131, 175, 422 (see Figure 2), dated by dendrochronology to 602/3 AD, contained three samples of ironworking debris. The furnace bottom was of height 120mm and of diameter 120-150mm. It was interesting as one area had been molten and displayed flow lines similar to that found on tap slag compared with the examples from context 204 (see McDonnell (1983)). It also had an unusually porous nature. An example of tap slag was recovered from this feature. This is molten slag that has been tapped off from the furnace to a pit where it is allowed to solidify before disposal. Other finds in this feature consisted of some dense slags which are also likely to be smelting products.

The final Saxon feature under consideration, F603, a quarry pit contained a lump of ironworking slag, although it is not possible to positively identify it as smelting or smithing slag.

Almost all the smelting slag is in the form of furnace bottoms or fragments of large masses of dense slag which are probably other, larger furnace bottoms. This indicates that the smelting process was a non-tapping one where slag was not tapped from the furnace but was allowed to solidify within it. The single fragment identified as tap slag may have been an accidental outflow from a collapsing furnace, or may just represent slag that became more liquid than normal within a furnace and flowed to a cooler part of it where it solidified.

Small quantities of slag and furnace/hearth lining came from features associated with the late Iron Age/Roman settlement, although most came from upper levels and may therefore be intrusive Saxon material. There are no significant concentrations of these finds, if they are contemporary with the features they should be

considered as a 'background' scatter indicating only some small-scale activity, although not necessarily within the excavated area.

Other Finds

Other finds from the Iron Age and Roman periods included some finds of bloated pottery, that is, pottery which has been heated too long in the kiln and has become very porous and brittle. The finds were examined using XRF but no evidence of them having been used for non-ferrous or ferrous metalworking was found.

Chigborough Farm - Introduction

The Chigborough Farm site is situated to the south east of Slough House Farm and has evidence of Iron Age through to post-medieval habitation. The technological evidence, however, was rather limited in quantity, although some possible evidence for a salt extraction industry was present.

Ironworking

The features producing ironworking slags could mainly be dated to the Iron Age/Roman period. There was a small amount of fairly dense slag which may be smelting slag but the majority of the finds were of a fairly vesicular (porous) nature and have been identified as smithing slags.

Salt Extraction

Three of the samples that were examined had been labelled on site as being possibly connected with the salt extraction industry. One of the samples (context 1830) from hearth 1828 was identified as a piece of fuel ash slag. The other two samples (from pits 4158 and 1705) were lumps of baked clay, both having a thick glassy layer. Under XRF analysis this layer was definitely identified as a silica based layer with traces of potassium, calcium and iron, all of which appeared in much the same proportions in the underlying clay layer. Therefore we can say that the siliceous layer was formed when the clay was at a high temperature. This fits very well with the description of salt extraction hearth linings of unidentified type in Rodwell (1979) when he says "often the 'lining' is nothing more than a hard-fired 'skin' on a mass of friable and poorly fired clay". This identification is backed up by the large amount of briquetage pottery that was recovered during excavation (M. Waughman pers. comm.). However, a proper interpretation of salt extraction evidence will only be possible when other areas of evidence, such as the fieldwork and pottery specialist reports, are also available.

Other Samples

A small oven, likely to be of medieval date, contained some fuel ash slag and a piece of burnt ceramic. Some bloated pottery was found in association with post-medieval features.

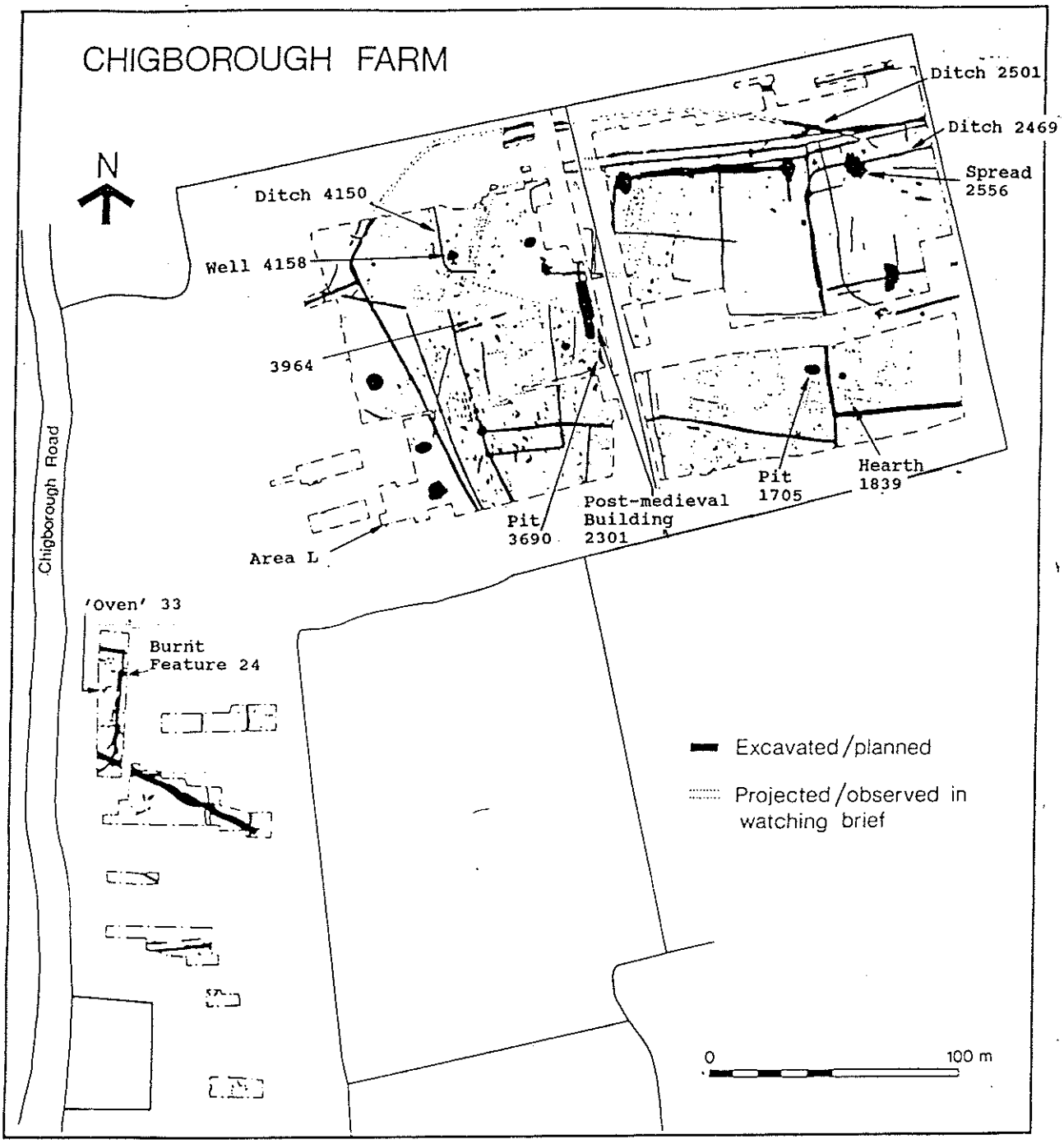

Figure 4. Plan of Chigborough Farm Excavations Showing Contexts and Features Referred to in the Text.

Conclusion

The Slough House Farm site produced evidence for iron smelting (and some smithing) in the early Saxon period. The smelting process appears to be a non-tapping one producing furnace bottoms. Similar, though larger slag blocks are known from Mucking where those examples that can be dated are also Saxon (Tylecote 1973, McDonnell forthcoming). Microstructural and chemical analysis of some of the Slough House Farm slag would contribute to an understanding of the technology producing it, and hence allow better interpretation of the economic basis and cultural affiliations of the craftsmen involved. This material, and the larger collection from the Rook Hall excavations, deserve fuller study than this present summary description.

The pre-Saxon material from Slough House Farm is mainly the normal scatter that is to be expected on any site of this period. The large Middle Iron Age dump of fuel ash slag is unusual but not unique; a similar dump was found at Prestatyn (Blockley 1989, 194). The slag from Chigborough Farm is also a background scatter to which can be added possible evidence for salt production.

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Table 1. Slough House Farm Total of Finds Weight (in kg)

	MBA	MIA	LIA	LIA/R	Roman	E Saxon	Saxon	MSA	Undated	TOTAL
Slag			0.04			14.91	0.38	0.01	0.19	17.42
Furnace Bottom						10.99	1.90			10.99
Fuel Ash Slag		9.19		Neg				0.02	0.01	9.22
Furnace/Hearth Lining			0.03		0.30	1.80			0.23	2.35
Miscellaneous						0.71				0.71
Ceramic					0.01	0.52		0.002		0.53
Burnt Stones		0.25								0.25
Bloated Ceramic		0.01		0.18					0.01	0.20
Iron Object						0.18			0.01	0.18
Charcoal	0.005		0.001			0.02				0.02

MSA=Main Settlement Area

Table 2. Catalogue of Slough House Farm Technological Samples by Period and Context.

Middle Bronze Age

3194 Upper fill of segment 3193 of Barrow B. The Barrow is well dated to the Middle Bronze Age.

Charcoal	0.0046 kg

Middle Iron Age

979 Dark brown clayey silt middle fill of F978, a curved gully dated to the middle Iron Age. Later than Enclosure B, thought if that Enclosure had a mound still surviving, F978 would have cordoned off its NE corner.

Fuel Ash Slag	9.1912
Stones	0.2549
	9.4461 kg

169 Fill of F168, ditch containing Middle Iron Age pot associated with Bronze Age barrow A.

Bloated Ceramic	0.0119 kg

Late Iron Age

264 Upper fill of a segment of the Enclosure C ditch which enclosed the Iron Age settlement. Context 264 and other contexts in the ditch contained Late Iron Age pot.

Furnace/Hearth Lining	0.0233 kg

2669 Fill of F2668, a Late Iron Age pit.

Charcoal	0.0006 kg

2894 Only fill of segment 2893 of ditch F2892 (Late Iron Age pot).

Furnace/Hearth Lining	0.0092 kg

2847 Finds recovered from surface of ditch F2816 by metal-detecting.

Ironworking Slag Lumps	0.0354 kg

Late Iron Age/Roman

3158 Top fill of F2895, a poorly dated gully containing only a few sherds of Late Iron Age/Roman pot that may well be residue.

Bloated Ceramic	0.0018 kg

2087 Fill of F2086, a cut feature containing a number of burnt stones, also 1st Century BC/1st Century AD pot.

Crushed Fuel Ash Slag	Neg. Amount

194 Spread of burnt material including much late 1st Century BC pot in upper fill of Late Iron Age ditch F177.

Bloated Pottery	0.1741g

Roman

2174 Middle fill of pit F2166, an early 1st Century AD rubbish pit.

Rough Ceramic	0.0068 kg

2980 Finds from segment across ditch F2938 and F2977, the latter probably a soakaway area.

Furnace/Hearth Lining	0.2966 kg

Early Saxon

196, 204 and 235 were the fills of pit F195 which contained early Saxon pot of probable 6th Century date. Fully excavated, all slag kept. The pit is probably an outlier of the group of similar features excavated at Rook Hall by P. Adkins. The Rook Hall site is immediately beyond Chigborough Road to the east of the site.

196 Dark greyish brown silty clay loam - upper fill

Ironworking Slag Lumps	1.0263
Hearth Lining	0.3535
Probable Smithing Slag Lumps	0.0788
Ceramic Material	0.0759
Iron Objects	0.0685
Charcoal	0.0006
	1.6036 Kg

204 Reddish black sandy silt loam with abundant charcoal middle fill

Fractured Smelting Slag	5.6757
Ironworking Slag Lumps	4.1486
Furnace Bottom	4.0803
Furnace Bottom	3.8555
Furnace Bottom	3.0502
Probable Smithing Slag Lumps	1.9280
Hearth Lining	1.4454
Miscellaneous	0.7116
Ceramic Material	0.4424
Iron Objects	0.1094
Charcoal	0.0158
	25.4629 Kg

235 Dark greyish brown silty loam - lower fill

Ironworking Slag Lumps	1.1296 kg

604 Fill of F603, a large quarry pit containing Early Saxon pot of probable 6th Century AD date.

Ironworking Slag Lump	0.9194 kg

Saxon

131, 175, 422 Fills of well F130, which had a timber shaft, the wood for which was felled in AD 602/3 and probably used immediately. 422 is the packing of the shaft, the other two fills belong to its silting.

131

Tap Slag Lump	0.2144 kg

175

Furnace Bottom (Molten Area)	1.9000 kg

422

Smelting Slag Lumps	0.1641 kg

Finds from Main Settlement Area (Probably Iron Age-Roman Period)

226 Fill of F225, 'Prehistoric' pot present.

Smithing Slag	0.0052 kg

426 Spread of material including Middle Iron Age pot (residual?) above a natural feature within roundhouse C.

Fuel Ash Slag	0.0063
Ceramic	0.0025
	0.0088 kg

657 Fill of F656, a posthole of roundhouse C.

Fuel Ash Slag	0.0152 kg

Undated

29 Medium greyish brown silty loam

Ironworking Slag Lumps	0.0551
Furnace/Hearth Lining	0.1096
	0.1647 kg

30 Light brown silt

Ironworking Slag Lumps	0.0387 kg

29 and 30 are fills of F28. No dating evidence. Fully excavated, all slag kept.

Problems

454 No information given.

Furnace/Hearth Lining	0.0856 kg

197 No information given.

Iron Object	0.0063
Furnace/Hearth Lining	0.0304
Smithing Slag Lumps	0.1002
	0.1369 kg

2399 No information given.

Fuel Ash Slag	0.0053 kg

2568 No information given.

Fuel Ash Slag	0.0024 kg

3057 No information given.

Bloated Ceramic	0.0094 kg

Table 3. Catalogue of Chigborough Farm Technological Samples by Period and Context.

Late Iron Age

2579 Fill of Late Iron Age ditch 2469 but contaminated with 2nd Century AD material from 2556

Two Hearth Bottoms

Roman

2564 Part of spread 2556 of 2nd-early 3rd Century AD material

Ironworking Slag Lumps

801 Final Backfill of 3rd Century AD well 800

High Temperature Ceramic

3704 Fill of pit 3690 3rd Century AD

Ceramic

4160 Pit/well 4158 3rd Century AD

Possible Briquetage Hearth Lining

4094 Surface ditch 4150 early 3rd Century AD

Ironworking Slag

1716 Fill of pit 1705 Late Roman

Possible Briquetage Hearth Lining

1830 Roman Hearth 1828? for salt extraction

Fuel Ash Slag

Medieval

154 From a small oven, may be medieval

Fuel Ash Slag

155 From a small oven, may be medieval

Burnt Ceramic

162 Fill of shallow burnt feature (24) ?medieval

Rough Ceramic/Baked Clay

Post Medieval

2300 Surface of post-medieval building 2301

Bloated Pottery

2526 Fill of post medieval ditch 2501

Bloated Pottery

Undated

500 Unstratified from area L

Ironworking Slag, possibly Smelting Slag

3965 Fill of cut feature 3964 undated

Bloated Pottery Smithing Slag Lump